Agents Concerned with Natural Crossing of Cotton in Oklahoma

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UPLAND cotton (Gossypium hirsutum L.) has been classified as "often cross-pollinated." Numerous reports appear in the literature concerning the percentage crossing between adjacent rows, between contrasting plants grown in varying ratios, and with different distances between contrasting types of cotton. Unpublished results of a Beltwide study collected by D. M. Simpson of the U. S. Cotton Field Station, Knoxville, Tenn., showed a range of approximately 3 to 60% crossing on green plants surrounded by red-leaf plants in a ratio of 1 to 9. Crossing determined in Oklahoma as a part of that study was roughly 25 to 30%.

The problem of maintaining purity of breeding stocks and varieties is complicated by this natural crossing. On the other hand, the possibility of utilizing natural crossing in some type of breeding procedure utilizing hybrid vigor has been recognized and suggested in the literature. A review of recent literature on the possibilities of hybrid cotton is presented by Loden and Richmond (8). These authors pointed out the problem attacked in the present study when they stated, "Consideration of natural crossing as a possible method of hybrid seed production necessitates the accumulation of information relative to another problem, namely, what agents are most effective in cross-pollination." This paper presents information on the agents affecting cross-pollination of cotton in Oklahoma.

REVIEW OF LITERATURE

When glass plates smeared with vaseline were exposed in cotton fields in north Georgia by Allard (2), considerable quantities of cotton pollen were collected. In Egypt, Balls (3), using the same method as Allard, obtained negative results; while Kearney (7), in Arizona, found the nature of the pollen grains of Gossypium unfavorable to their being transported by currents.

Brown (4) in Mississippi, Collings and Khan (1) in South Carolina and Kearney (7) in Arizona reported that cotton was apparently crossed only by insects. Afzal and Khan (1) found many types and species affecting cross-pollination, but three species of a family, namely Apis dorsata Fab., Anthophora, and Eris thoracica Lepel., were found to be important. However, they reported a very low percentage of crossing occurring in Punjab. Allard (2) in north Georgia a large wasp, E. plumipes, was the most active insect in cross-pollination. He found the honey bee and a wild bee, Melissodes bimaculata, to be the most abundant and most consistent flower visitors.

Of the various hymenopterous species which might act as cotton pollinators, bumble bees seem to be the most important. Pope, Simpson, and Duncan (9) named the bumble bee as the most important in natural crossing in cotton in Tennessee, as did Shoemaker (10) in Texas. Honey bees were frequent visitors of the cotton flower but were not regarded as important carriers except when they visited the flower for the specific purpose of obtaining pollen.

Stephens and Finkner (11) and Ware (12) concluded that the differences in amounts of cross-pollination were due primarily to differences in the size of the bee population. Because of the rather wide differences in amounts of cross-pollination observed, Hayes and Garber (6) stated that varietal differences appeared to be one probable cause of discrepancies.

EXPERIMENTAL PROCEDURE

These studies were made on the Oklahoma A. and M. College Agronomy Farm at Stillwater, Okla., and on research plots at the upper end of Lake Carl Blackwell about 12 miles west by north.

1 Contribution from Agronomy Department, Oklahoma Agr. Exp. Sta., Stillwater, Okla. Received for publication March 26, 1953.

2 Graduate assistant in agronomy. Part of a thesis submitted in partial fulfillment of the requirements for the Master of Science degree. This study was conducted under the joint supervision of Professors Melvin D. Jones and John M. Green.